1970-71 Irish Potato CULTIVAR TRIALS

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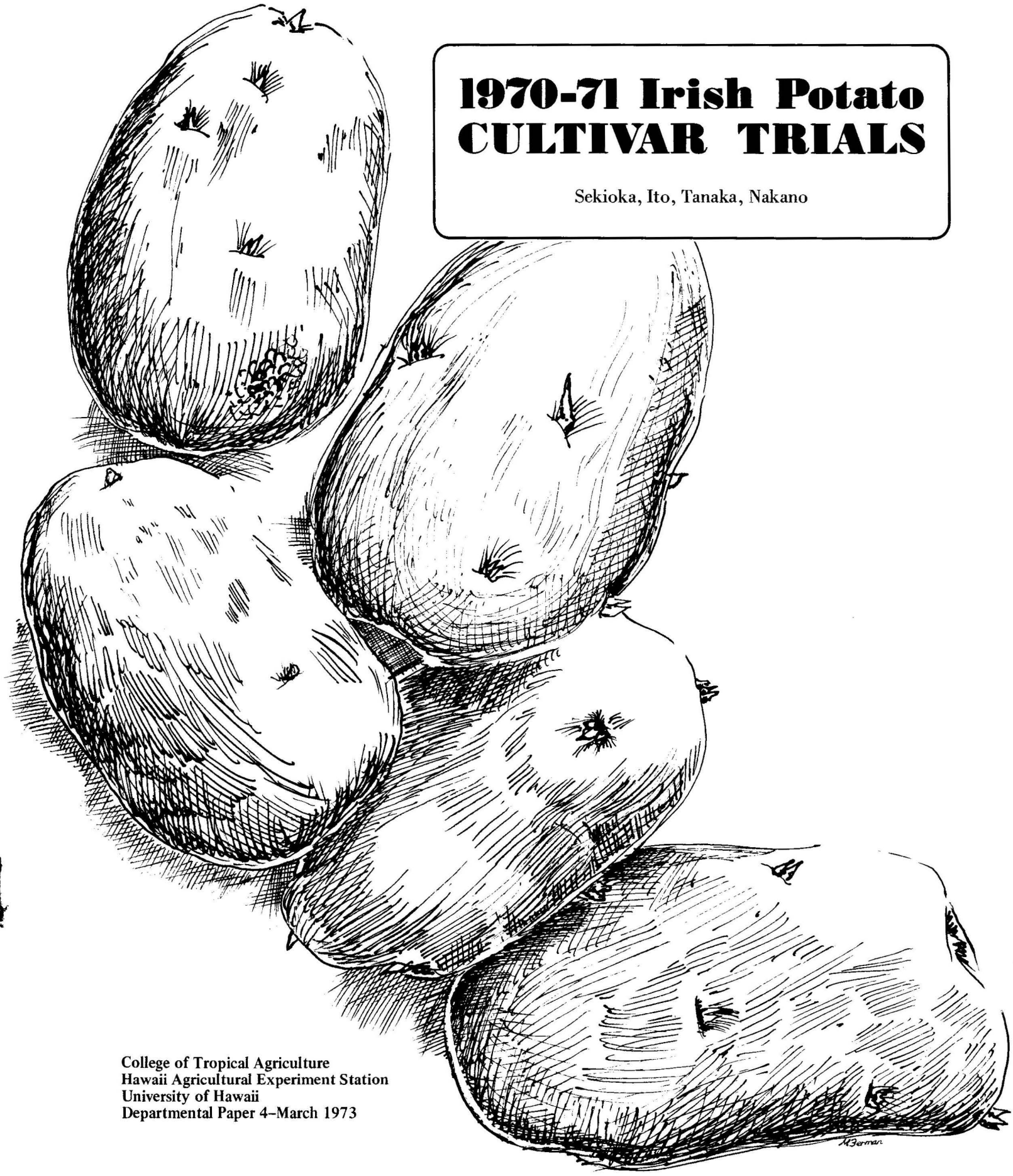

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1970-71 Irish Potato Cultivar Trials

T.T. Sekioka, P.J. Ito, J.S. Tanaka, and R.T. Nakano

Introduction

There is renewed interest in the production of Irish potatoes (Solanum tuberosum) in Hawaii. Much of this interest is inspired by the large and increasing local market for potatoes. The annual import for 1970 was 36 million pounds (1). Earlier studies (3) have indicated that most temperate cultivars are not very productive because of their susceptibility to late blight (Phytophthora infestans). At higher elevations in Hawaii, 'Pele', a 1970 release of the Hawaii Agricultural Experiment Station, is recommended for production (2). The purpose of this paper is to present data on recent introductions and advanced selections.

Materials and Methods

Experimental trials were conducted at 8 locations. The 8 locations represent a wide variation of environmental conditions--1 through 4 on the Island of Hawaii, 5 on the Island of Oahu, and 6 through 8 on the Island of Kauai. The experimental sites on the Island of Hawaii were: (1) Volcano Station (elevation 4000 feet, rainfall 125 inches, average temperature range 50-60 F); (2) Lalamilo Station (elevation 2500 feet, rainfall 30 inches, average temperature range 59-73 F); (3) Mealani Station (elevation 2800 feet, rainfall 56 inches, average temperature range 55-69 F); (4) Lamb Brothers' Farm (elevation 3000 feet, no rainfall or temperature records available). The experimental site on the Island of Oahu was the (5) Poamoho Station (elevation 700 feet, rainfall 45 inches, average temperature range 67-82 F). The experimental sites on the Island of Kauai were (6) Wailua Station (elevation 550 feet, rainfall 95 inches, average temperature range 68-78 F); (7) Kilauea Sugar Plantation Air Strip (elevation 430 feet, rainfall 90 inches, average temperature range 67-80 F); (8) Kilauea Sugar Plantation Field 31 (elevation 325 feet, rainfall 85 inches, average temperature range 66-80 F).

The bulk of the cultivars tested were University of Hawaii (S) selections, Frito-Lay (FL) clones, and named varieties. Other clones tested were received from Alaska and Washington.

The seed pieces used for planting averaged 1.5 ounces in weight. The seed pieces were allowed to suberize for 7 to 10 days. At the time of planting, the seed pieces were dusted with Captan.

The fertilizer regime varied between locations. The total nitrogen fertilizer used at planting and side dressing ranged from 90 to 220 pounds

actual per acre. The phosphorus application ranged from 150-360 pounds actual and the potassium 150 to 250 pounds actual per acre. Epsom salt at 300 pounds per acre was applied at some locations.

The soil was fumigated with methyl bromide, DD, or Telone for nematode control at several locations. At most locations Di-syston systemic insecticide was applied in the fertilizer band at 2 pounds actual per acre. Terraclor was also applied over the furrow at 15 pounds actual per acre.

The experimental design used was a randomized block with 2 or 3 replications. The observational trials were not replicated. The plots were single rows 20 or 30 feet long.

The methods used in harvesting and presenting tuber yield varied between locations. Hawaii standards for grades of potatoes were used to evaluate the clones. In some cases, the different grades were combined and presented as marketable yield. At the Volcano Station, the number of culls per plant was recorded. Specific gravity, a measure of quality, was determined from a representative sample of the plot. Several traits were rated. Tuber type, a measure of the overall appearance of the tuber, was rated 1 to 5 with 1 excellent and 5 poor. Plant maturity was rated 1 to 6 with 1 early and 6 late. Plant vigor was also rated 1 to 6 with 1 strong and 6 weak. At the Lalamilo Station, an incidence of late blight, Phytophthora infestans, was rated 1 to 5 with 1 very little defoliation and 5 defoliation of 90 percent or more.

Results and Discussion

The results (Table 1 to 15) show generally that potatoes grow relatively better at higher elevations because of the cooler temperatures. Experiments at the lower elevations were conducted during the warm season in hopes of finding clones best adapted to high temperatures. In general, the early maturing clones did relatively better than the late maturing clones at low elevations.

Results from high-elevation locations indicated that 74-S, 'Pele', 63-S, 25-S, and 11-S were best adapted. The HAES selections do relatively better at higher elevations, probably because of their genetic background and initial selection at high elevation. These clones did poorly, however, at lower elevations and cannot be considered for growing at the lower elevations.

For low-elevation conditions, especially during the warmer season, no clone was found to be well adapted. For all experiments conducted at the lower elevations, 'Red Pontiac', 'Bliss Triumph', and B5141-6 did relatively well.

Although late-blight defoliation was recorded for only one of the plots, other experiments reflected late blight conditions. In spite of weekly fungicide spraying to control late blight, timing and weather conditions were often favorable for blight. Thus, the lower yields of many of the entries were due to susceptibility to late blight.

In general, the specific gravity determinations in this study were acceptable. However at lower elevations, the specific gravity readings were low.

From the unreplicated observational trials, 7 clones were found sufficiently superior to merit advancing them into the advanced trials. These 7 clones were 'Chieftan', 'Netted Gem', 'W1683', 'FL460', 'FL315', 'Alaska Frostless', and '6'.

Summary

The performance of 64 clones which were grown in as many as 8 locations is presented. The purpose of this report is to summarize data on recent selections and introductions since the release of cultivar 'Pele' by the Hawaii Agricultural Experiment Station.

None of the temperate region cultivars tested is considered as acceptable for planting at higher elevations as is 'Pele'. Four of the HAES selections, 15-S, 63-S, 11-S, and 25-S, were considered equal to 'Pele'. No suitable clone was found to be adapted to all year growing conditions at low elevation in Hawaii.

Literature Cited

1. Hawaiian Agriculture. 1970. U. S. Dep. Agr. Hawaii Dep. Agr. 77 p.

2. Ito, P. J. 1970. Potato Production in Hawaii, Australia, Philippines, and Asian countries. Proc. Second International Symposium on Tropical Root and Tuber Crops. 1:116-119.

3. _____, J. A. Crozier, Jr., and T. T. Sekioka. 1970. Performance of Ten Potato Cultivars in Hawaii. Hawaii Farm Science. (In press).

Table 1. Evaluation of twenty-four potato cultivars at the Lalamilo Station, planted 7-9-70, harvested 1-18-71

Cultivar	Yield		Maturity rating[1]	Late blight defoliation rating[2]
	Marketable cwt/acre	Total cwt/acre		
74-S	250.9 a[3]	281.7 abcd	5.0	1.5 cd
Pele	240.7 a	333.1 a	6.0	1.5 cd
FL162	194.6 ab	240.2 abcde	4.0	2.0 bcd
FL96	194.0 ab	282.6 abcd	2.5	4.0 a
FL64	192.2 ab	284.9 abcd	3.5	4.0 a
63-S	192.0 ab	289.2 abc	5.0	1.0 d
11-S	188.8 ab	312.2 ab	5.5	1.0 d
2-S	176.0 ab	221.9 abcde	4.5	2.0
80-S	171.9 ab	236.4 abcde	5.0	1.5 cd
72-S	169.6 ab	214.0 abcde	4.5	1.5 cd
62-S	169.0 ab	253.5 abcde	4.0	1.0 d
FL2	161.2 abc	226.8 abcde	3.5	4.5 a
12-S	161.2 abc	235.5 abcde	5.5	1.0 d
25-S	151.0 abc	177.1 bcdef	6.0	1.0 d
14-S	143.8 abc	188.2 abcdef	4.0	1.5 cd
75-S	143.5 abc	168.1 bcdef	4.0	1.0 d
15-S	142.9 abc	203.6 abcde	5.5	1.0 d
71-S	130.1 abc	157.4 cdef	4.0	1.0 d
32-S	125.2 abc	153.3 cdef	5.0	1.0 d
Kennebec	122.6 abc	144.0 cdef	3.5	3.0 abc
Red La Soda	117.3 abc	146.1 cdef	3.0	3.5 ab
60-S	97.9 bc	137.7 def	5.0	2.0 bcd
20-S	88.9 bc	106.0 ef	5.5	1.0 d
78-S	29.0 c	47.0 f	4.5	3.0 abc

[1] Plant maturity was rated 1 to 6 with 1 early and 6 late.

[2] Late blight defoliation was rated 1 to 5 with 1 very little defoliation and 5 defoliation of 90 percent or more.

[3] Within columns means with the same letter do not differ at the 5 percent level using Duncan's Multiple Range Test.

Table 2. Evaluation of fourteen potato cultivars at the Mealani Station, planted 8-13-70, harvested 1-4-71

Cultivar	Yield		Vigor[1/] rating	Specific gravity
	Marketable cwt/acre	Total cwt/acre		
74-S	633.5 a[2/]	770.9 ab	1.7	1.071
Pele	608.8 ab	791.8 ab	1.3	1.070
63-S	572.3 abc	773.1 ab	2.0	1.081
25-S	550.3 abc	746.2 abc	1.0	1.076
75-S	498.7 bc	809.5 ab	1.3	1.086
62-S	483.4 cd	690.3 d	1.7	1.071
11-S	475.7 cde	699.2 abcd	2.0	1.071
20-S	462.5 cde	627.9 abcd	1.7	1.078
78-S	447.8 cde	581.4 abcd	1.7	1.089
12-S	444.3 cde	886.2 a	1.0	1.075
60-S	367.5 de	498.3 bcd	2.0	1.065
80-S	353.5 ef	432.6 cd	1.3	1.076
71-S	243.3 fg	535.4 bcd	2.5	1.072
72-S	231.2 g	395.9 d	2.7	1.077

1/ Plant vigor was rated 1 to 6 with 1 strong and 6 weak.

2/ Within columns means with the same letter do not differ at the 5 percent level using Duncan's Multiple Range Test.

Table 3. Evaluation of four potato cultivars at the Mealani Station, planted 8-13-70, harvested 11-20-71

Cultivar	Yield		Vigor[1/] rating
	Marketable cwt/acre	Total cwt/acre	
FL-2	165.9	186.7	4
FL-64	301.6	370.8	3
FL-96	153.8	233.3	4
FL-162	188.8	270.1	4

This test was not replicated.

[1/] Plant vigor was rated 1 to 6 with 1 strong and 6 weak.

Table 4. Evaluation of seventeen potato cultivars at the Mealani Station, planted 4-71 and harvested 8-27-71

Cultivar	Yield	
	Hawaii No. 1 cwt/acre	Total cwt/acre
Chieftain	290.4	338.8
Netted Gem	238.8	334.8
W168-3	210.0	290.4
FL460	207.4	259.3
Kennebec	198.9	353.5
FL96	184.6	206.6
FL315	183.1	296.7
Alaska Frostless	181.5	260.2
FL2	176.3	207.4
FL162	169.4	248.0
FL18	168.1	206.3
FL530	145.2	170.8
Norgold Russet	125.4	191.4
FL64	116.2	251.7
ND7003-2	94.4	145.2
ND6993	72.6	125.4
62-90-64	30.7	61.4

This test was not replicated.

Table 5. Evaluation of five potato cultivars at the Lamb Brothers' Farm, Kamuela, Hawaii, planted 5-19-70 and harvested 9-24-70

Cultivar	Marketable cwt/acre	Total cwt/acre	Specific gravity
14-S	385.3 a[1/]	430.3 a	1.086
80-S	370.5 a	403.3 a	1.083
25-S	369.5 a	407.1 a	1.082
11-S	183.2 a	242.1 a	1.065
Pele	176.6 a	216.8 a	1.073

[1/] Within columns means with the same letter do not differ at the 5 percent level using Duncan's Multiple Range Test.

Table 6. Evaluation of eight potato cultivars at the Lamb Brothers' Farm, Kamuela, Hawaii, planted 5-19-70 and harvested 9-18-70

Cultivar	Yield Total cwt/acre
FL-2	37.1 a[1/]
FL-64	24.4 a
FL-96	24.0 a
FL-162	16.6 a
Norchip	11.6 a
Kennebec	8.7 a
Norland	8.0 a
Red La Soda	5.3 a

[1/] Within columns means with the same letter do not differ at the 5 percent level using Duncan's Multiple Range Test.

Table 7. Evaluation of thirteen potato cultivars at the Volcano Station planted 5-6-70 and harvested 10-6-70

Cultivar	Marketable Yield cwt/acre	Culls No./plant	Tuber[1/] Type rating	Maturity[2/] rating	Specific gravity
15-S	453.8 a[3/]	0.2115	3	3	1.080
11-S	388.2 ab	0.9630	3	3	1.068
25-S	383.0 ab	0.4082	2	3	1.077
Pele	310.2 bc	0.7556	3	4	1.074
71-S	303.4 bcd	2.9231	3	4	1.079
70-S	224.7 cde	1.7714	3	4	1.067
60-S	219.1 cdef	1.4773	2	2	1.067
10	174.4 defg	1.2008	3	3	1.077
78-S	162.6 defg	1.1200	4	2	1.086
82-S	151.5 defg	4.3250	4	3	1.087
72-S	127.3 efg	2.1111	3	3	1.098
14	87.6 fg	0.6030	-	2	1.067
5	52.5 g	0.3616	-	1	---

1/ Tuber type was rated 1 to 5 with 1 excellent and 5 poor.

2/ Plant maturity was rated 1 to 6 with 1 early and 6 late.

3/ Within columns means with the same letter do not differ at the 5 percent level using Duncan's Multiple Range Test.

Table 8. Evaluation of nine potato cultivars at the Volcano Station, planted 5-6-70 and harvested 10-6-70

Cultivar	Marketable yield cwt/acre	Culls No./plant	Maturity 1/ ratings
20-S	457.4	0.9000	3
6	326.7	14.0000	4
27	163.4	9.7500	1
25	101.6	1.8571	1
N-3	53.2	0.0000	1
N-6	38.7	0.6667	1
12	43.6	2.5000	1
N-5	33.6	2.0000	2
4	31.9	1.0000	1
26	26.1	0.7000	1

This test was not replicated.

1/ Plant maturity was rated 1 to 6 with 1 early and 6 late.

Table 9. Evaluation of eight potato cultivars at the Volcano Station, planted 5-21-70 and harvested 9-21-70

Cultivar	Marketable yield cwt/acre	Culls No./plant
Red La Soda	240.9 a[1/]	1.1317
FL-2	203.8 ab	0.5862
FL-64	179.1 abc	2.0334
FL-162	173.7 abc	1.6667
Norland	154.6 abc	1.2148
Kennebec	150.0 abc	0.9586
FL-96	111.8 bc	2.2282
Norchip	93.1 c	1.2069

[1/] Within columns means with the same letter do not differ at the 5 percent level using Duncan's Multiple Range Test.

Table 10. Evaluation of twenty-three potato cultivars at the Volcano Station, planted 7-28-70 and harvested 2-18-71

Cultivar	Marketable Yield cwt/acre		Culls No./plant	Maturity[1] rating	Specific gravity
11-S	233.5	a[2]	0.7821	3	1.060
63-S	225.8	a	0.6153	3	1.073
78-S	216.0	ab	0.4595	3	1.088
15-S	183.0	abc	0.1333	4	1.069
2-S	178.3	abcd	0.8333	3	1.066
62-S	175.9	abcd	1.9200	3	1.079
25-S	158.4	abcde	0.5000	3	1.066
20-S	146.0	abcde	1.1111	4	1.069
80-S	142.6	abcdef	0.4364	3	1.083
Pele	113.5	bcdefg	0.2535	3	1.071
14-S	110.8	bcdefg	0.7937	4	1.072
74-S	109.4	bcdefg	0.8750	2	1.067
75-S	105.5	cdefg	0.3810	3	1.082
FL-2	91.6	cdefg	0.0000	1	1.081
71-S	91.5	cdefg	0.5161	2	1.067
60-S	87.9	cdefg	0.0588	3	1.069
32-S	85.4	cdefg	0.3433	3	1.060
72-S	73.0	defg	0.6939	2	1.071
64-S	56.6	efg	0.1940	3	1.064
FL-96	54.5	efg	0.5745	1	1.083
FL-64	54.2	efg	0.1739	1	1.077
FL-162	33.7	fg	0.2791	1	1.086
12-S	32.7	g	0.5389	3	1.059

[1] Plant maturity was rated 1 to 6 with 1 early and 6 late.

[2] Within columns means with the same letter do not differ at the 5 percent level using Duncan's Multiple Range Test.

Table 11. Evaluation of twenty-one potato cultivars at the Wailua Station, Kauai, planted 10-13-69 and harvested 1-27-70

Cultivar	Hawaii No. 1 cwt/acre	Total cwt/acre	Vigor[1]	Tuber type[2]	Specific growth
25-S	167.7 a[3]	187.1 a	1.0	3.0	1.078
71-S	144.9 ab	159.0 ab	1.3	3.0	1.083
Red Pontiac	127.2 abc	133.4 abcde	2.7	3.0	1.064
82-S	119.7 abcd	129.6 abcde	2.7	3.0	1.080
Pele	116.9 abcd	138.7 abcd	2.3	3.0	1.073
Kennebec	115.3 abcde	121.8 bcde	3.3	3.3	1.073
Hawaiian Rose	114.8 abcde	134.0 abcde	3.0	3.0	1.059
15-S	105.3 bcde	153.5 abc	1.7	3.3	1.068
20-S	100.5 bcdef	116.1 bcdef	2.0	2.7	1.078
B5141-6	99.8 bcdef	104.7 bcdef	3.0	2.7	1.091
63-S	98.2 bcdef	116.5 bcdef	3.0	3.0	1.079
Russet Sebago	94.3 bcdef	101.7 bcdef	3.3	3.0	1.066
Greta	91.4 bcdef	109.7 bcdef	3.0	3.3	1.085
64-S	84.6 cdef	104.3 bcdef	3.0	3.0	1.068
Atzimba	82.3 cdef	95.8 bcdef	2.7	2.7	1.076
B5080-7	73.0 cdef	106.6 bcdef	2.7	3.0	1.067
78-S	70.8 cdef	85.1 def	2.7	2.7	1.092
80-S	68.0 def	78.1 def	3.3	3.3	1.081
60-S	66.4 def	94.1 cdef	3.7	3.3	1.075
B5755-8	56.9 ef	70.1 ef	3.7	3.3	1.060
Elenita	44.0 f	53.9 f	3.3	3.3	1.086

[1] Plant vigor was rated 1 to 6 with 1 strong and 6 weak.

[2] Tuber type was rated 1 to 5 with 1 excellent and 5 poor.

[3] Within columns means with the same letter do not differ at the 5 percent level using Duncan's Multiple Range Test.

Table 12. Evaluation of twelve potato cultivars at Field 31, Kilauea Sugar Plantation, planted 5-25-70 and harvested 10-22-70

Cultivar	Hawaii No. 1 cwt/acre	Total cwt/acre	Tuber type rating[1/]	Vigor rating[2/]	Specific gravity
B5141-6	207.1 a[3/]	227.9 abc	2.5	2.7	1.081
Hawaiian Rose	180.4 a	238.6 ab	2.0	2.7	1.058
Red Pontiac	165.8 a	239.4 ab	3.0	2.0	1.058
Kennebec	154.6 a	225.8 abc	3.5	1.3	1.063
63-S	70.8 b	266.9 a	2.0	1.3	1.071
20-S	67.4 b	149.3 bcd	3.0	1.7	1.072
25-S	54.5 b	115.5 d	2.5	1.0	1.060
Greta	51.8 b	182.4 abcd	3.0	2.0	1.078
82-S	30.9 b	226.7 abc	4.0	1.0	1.068
Pele	30.2 b	127.9 cd	2.0	1.0	1.064
15-S	27.2 b	150.6 bcd	3.5	1.0	1.069
71-S	10.4 b	150.6 bcd	3.5	2.3	1.073

[1/] Tuber type was rated 1 to 5 with 1 excellent and 5 poor.

[2/] Plant vigor was rated 1 to 6 with 1 strong and 6 weak.

[3/] Within columns means with the same letter do not differ at the 5 percent level using Duncan's Multiple Range Test.

Table 13. Evaluation of twelve potato cultivars at the Air Strip, Kilauea Sugar Plantation, planted 5-25-70 and harvested 10-22-70

Cultivar	Hawaii No. 1 cwt/acre	Total cwt/acre	Tuber type rating[1/]	Vigor rating[2/]	Specific gravity
Kennebec	276.2 a[3/]	329.5 a	3.0	1.3	1.060
B5141-6	124.0 b	150.5 bcd	2.5	2.3	1.079
Hawaiian Rose	103.0 bc	149.0 bcd	2.0	3.0	1.060
Red Pontiac	82.8 bcd	188.3 bc	3.0	2.0	1.060
Greta	77.9 bcd	193.6 bc	3.7	1.7	1.074
63-S	75.2 bcde	205.5 b	2.3	1.3	1.063
20-S	67.1 cdef	176.8 bc	3.3	1.7	1.062
25-S	50.5 def	122.6 cd	2.5	2.0	1.067
Pele	37.4 def	161.3 bcd	2.3	1.0	1.060
82-S	34.6 def	219.3 b	4.3	1.0	1.068
15-S	25.0 ef	142.5 bcd	3.5	1.0	1.060
71-S	21.4 f	93.2 d	3.5	2.0	1.074

1/ Tuber type was rated 1 to 5 with 1 excellent and 5 poor.

2/ Plant vigor was rated 1 to 6 with 1 strong and 6 weak.

3/ Within columns means with the same letter do not differ at the 5 percent level using Duncan's Multiple Range Test.

Table 14. Evaluation of eight potato cultivars at Field 31, Kilauea Sugar Company, planted 2-5-71, harvested 5-19-71

Cultivar	Yield		Maturity rating[1/]
	Hawaii No. 1 cwt/acre	Total cwt/acre	
FL162	88.12 a[2/]	184.53 a	2.3
Red La Soda	84.43 a	177.61 a	2.0
FL96	77.30 ab	170.76 ab	3.7
FL2	54.81 abc	111.03 c	3.0
Norland	46.96 bc	101.74 c	1.0
FL64	35.08 c	124.33 bc	2.0
Norchip	26.57 c	116.22 c	4.0
Kennebec	23.38 c	173.76 a	3.0

[1/] Plant maturity was rated 1 to 6 with 1 early and 6 late.

[2/] Within columns means with the same letter do not differ at the 5 percent level using Duncan's Multiple Range Test.

Table 15. Evaluation of nine potato cultivars at the Poamoho Station, planted 3-4-71 and harvested 6-14-71 and 8-2-71

Cultivar	Yield	
	Hawaii No. 1 cwt/acre	Total cwt/acre
FL2	46.8	55.7
FL64	63.7	75.7
FL96	68.9	83.9
FL162	73.5	96.5
11-S	19.1	19.1
15-S	8.2	8.2
25-S	15.8	15.8
Pele	6.8	6.8
70-S	27.2	27.2

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